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Considering stakeholders' matchmaking as innovative business models to promote Low Carbon Technology Transfer

Rabhi Abdessalem

Business and Environment, IGES

IGES
Institute for Global Environmental Strategies

1. Introduction

The key role of technology transfer in tackling climate change has been acknowledged since the creation of the United Nation Framework Convention on Climate Change (UNFCCC) in 1994, iterated at each session of the Conference of the Parties (COP), and resulted in some developmental progress, but is still considered a hot topic and an urgent challenge. The continuous focus on promoting low carbon technology transfer (LCTT) is due to the fact that although numerous discussions have taken place on the topic at national, regional and international levels, no consensus has been reached on who to do what, and how? The lack of broad consensus is understandable given that LCTT is a complex process and involves a wide variety of stakeholders; however, it could also be related to the fragmental nature of the discussions, which tend to focus merely on particular aspects rather than the big picture (Intellectual Property Right, Finance, Information Sharing, Technical Assistance, etc.), which means that any recommendations or conclusions provided lack comprehensive scope, despite their relevance.

To truly promote LCTT, this paper proposes to: 1) Address the whole process of LCTT rather than just part of it, and 2) Initiate stakeholders' matchmaking platforms that facilitates "on the ground" and "online" matching of Businesses-to-Businesses (B2B), Businesses-to-Funding institutions (B2F), and Businesses-to-Policy makers (B2P).

The remainder of the paper is arranged as follows. The second section briefly outlines key issues to promote LCTT; the third section provides aspect of strategy on how to truly promote LCTT; and the fourth section concludes.

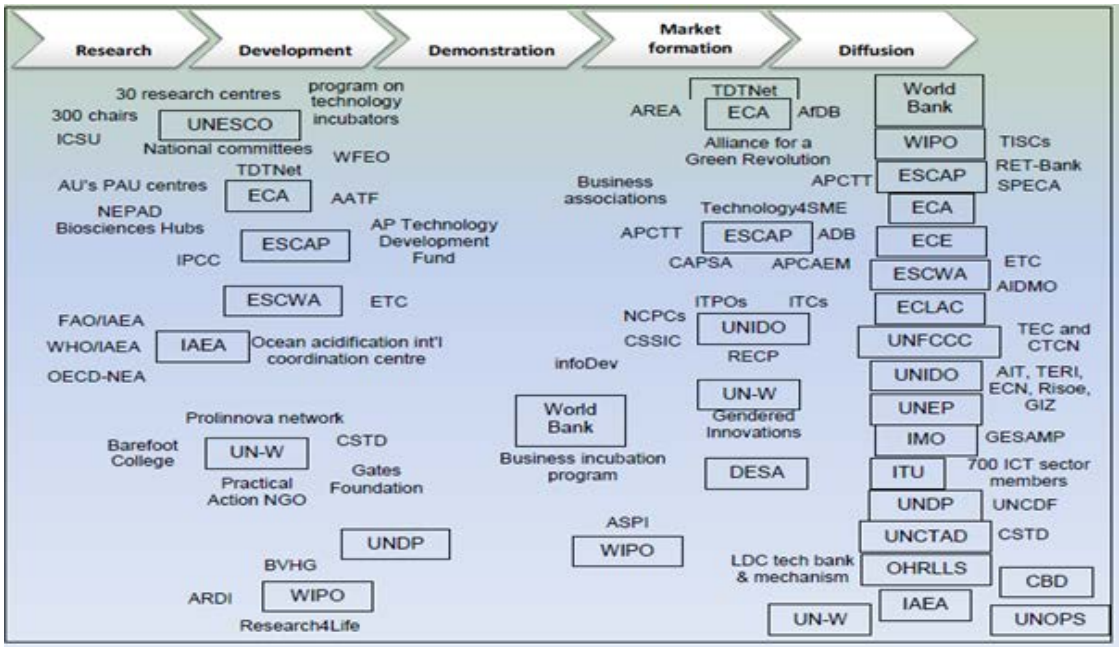
2. Issues to promote LCTT

2.1 Fragmented and weakly coordinated models/initiatives

Various stakeholders are making significant efforts to promote LCTT and a large number of partnerships, programmes, projects and instruments on this regard are managed by United Nation organisations (fig.1). However, no framework, agreement, assessment or monitoring mechanism currently exists to bind them all together, which means they are becoming ever more fragmented and uncoordinated in terms of objective, content and country coverage. Most of them only focus on specific sectors or particular regions and involve major overlaps, with most contributions focusing on either research and development or transition from market formation to diffusion.

In the absence of an effective coordination mechanism, addressing all the stages of technology transfer and coordinating between such initiatives is a challenging task. Hence, a technology facilitation mechanism that builds on this work and reaps synergy through networking and partnerships is urgently required.

Figure 1: Overview of United Nations contributions (boxes) and selected partnerships (without boxes)



Source: UN Secretary General report A/67/348 (2012, 27)

2.2 Lack of information on 'seeds' and 'needs'

In terms of manufacturing and export of low carbon technology, several developing countries have become world leaders, and some are also emerging as key users. South-South clean technology transfer is also increasingly becoming more important. Hence, the availability of information on what technologies exist on the supply side (hereafter "seeds") and which technologies are needed on the demand side (hereafter "needs") is crucial to kick-off the matchmaking process between seeds and needs. For most countries, comprehensive databases on seeds and needs do not exist, or are difficult to access or scattered among institutions. Most of the focus has not been on creating and sharing such information (i.e., through development of Technology Need Assessment (TNA) and Technology Availability Assessment (TAA)), and instead has centered on crafting policies related to market transformation to absorb available technologies. Likewise, although TNAs exist for some countries they are not updated regularly, and for most countries TAA and TNA still await development.[1]

2.3 Little action on pilot/demonstration projects

As depicted in Fig.1 above, most initiatives are focusing on either research and development or transition from market formation to diffusion rather than on demonstration or linking demonstration to market formation. In addition, significant efforts and resources have been allocated to conduct feasibility studies (FSs) about the application of technology to specific conditions, whereas little action is taken to follow-up on those FSs. For instance, in 2012 a total of 60 FSs in the field of electricity generation, forest conservation, transportation and waste

[1] TNA country reports are available at the following link: http://unfccc.int/ttclear/templates/render_cms_page?TNR_cre (last access Jun. 9th 2014)

management were conducted in East Asia by Global Environmental Facility (GEF); In 2013, about 7.6 billion yen (76 million USD) was earmarked for model projects in addition to FSs in the same region[2]; Japan is the current leader in number of FSs under the Joint Crediting Mechanism (JCM) scheme, where more than 165 have been conducted by governmental agencies through the Global Environmental Centre foundation (GEC), Japan International Cooperation Agencies (JICA), and others.[3] However, only a few projects have actually been implemented on the ground, and the implemented ones (model projects) will have limited impact unless they are replicated, which requires a follow up actions.

3. Aspect of strategy

3.1 Address the whole process of LCTT rather than just part of it (e.g. through decomposing it into three stages)

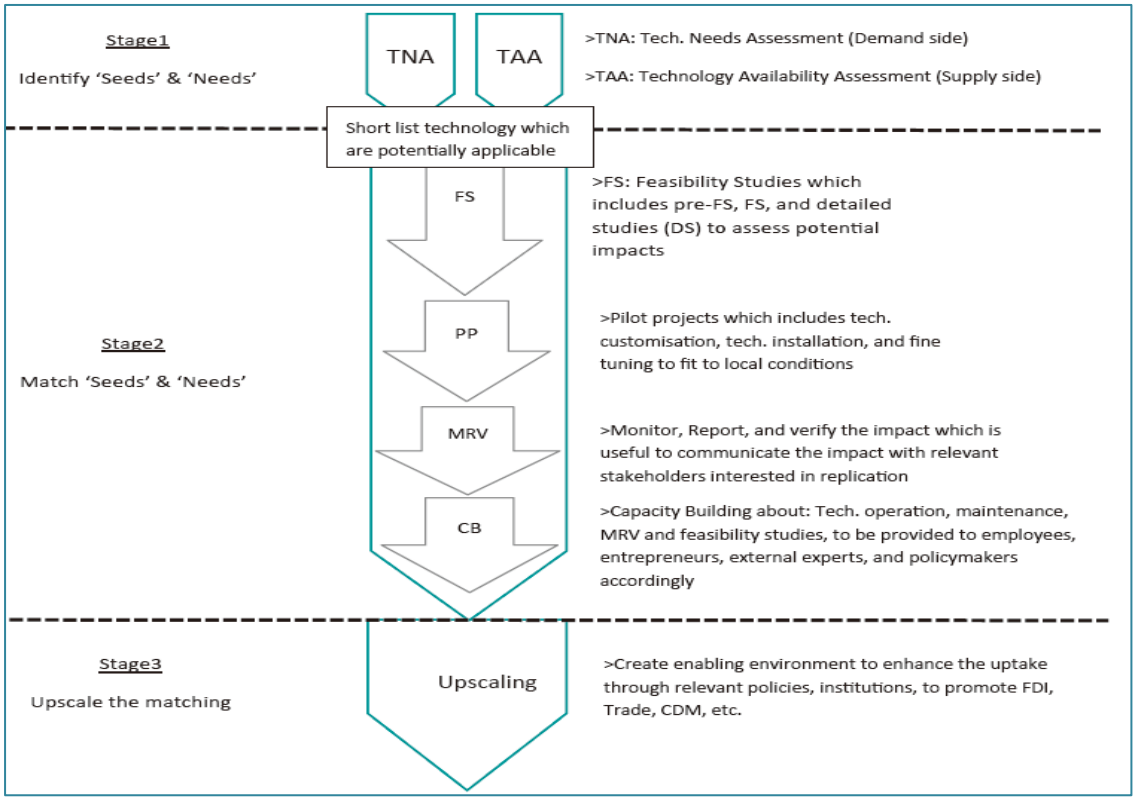
It is evident today more than any time before that significant information and knowledge gap exists between various stakeholders involved in the LCTT process. For instance, technologies are available, polices and initiatives are available, financial options are available; but not every stakeholders knew about them and or has access to them. How to fill the information and knowledge gap between stakeholders, how to reduce the information and transactions costs, and ultimately, how to mobilize and coordinate among the appropriate stakeholders to accelerate the flow of technology and finance, are the key issues/challenges.

Those challenges should be addressed collectively and systematically through addressing the whole LCTT process. This paper considers LCTT process as consisting of three steps. First, identification of seeds and needs. It involves coordination among various stakeholders, from both supply and demand sides, to identify a list of technologies which are available at the supply side, needed from the demand side, and especially transferable and applicable at local conditions. The second step consists of matching the seeds with needs. It consists of cooperation among various stakeholders, from supply and demand sides, to conduct joint actions to actually transfer and apply the technology in the recipient country (perhaps at site level) through feasibility studies, demonstration cases (pilot projects), assessment of impact, awareness creation and capacity building, etc. The third step consists of scaling up the matching process of seeds and needs to diffuse the technology more widely in recipient countries (cluster, sector, or nationwide). It consists of creating an enabling environment to enhance the diffusion of the technology through conventional channels, especially Foreign Direct Investment (FDI) and trade. The schematic diagram of the technology transfer process considered in this chapter is given in Figure2 below, although the overall process is, of course, much more complicated and much less mechanistic than is depicted in the figure.

[2]http://www.thegef.org/gef/whatisgef

[3] http://gec.jp/

Fig.2: technologies transfer process as viewed in this paper



The following discussion traces the structure of LCTT processes, and highlights several issues related to each step of the process.

3.1.1 Identification of "seeds" and "needs"

The availability of technology needs assessments (TNA) and technology availability assessments (TAA) are extremely important to identify the seeds and needs, and to save time and efforts to start the process of matching them, since they provide guidance about what is available on the supply side and what is needed in the demand side. Nevertheless, the availability of TNAs and TAAs, is just one initial step, since some technologies could be identified as available in TAA as well as identified as needed in TNA, but actually not transferable and applicable at local conditions due to technical, environmental, social, financial, or other reasons. Hence, after developing TNA and TAA, one needs to analyze the potential for LCTT between each pair of countries, resulting in a shorter list of technologies, which are listed as not only available and needed, but also potentially applicable in the recipient country. Furthermore, given that technology transfer is a dynamic process and surrounding conditions are changing rapidly, the identified short list of technologies should be updated often, and shortened further if possible, based on further analysis of surrounding conditions including the conduct of feasibility studies and detailed studies.

Identification of seeds and needs shouldn't be limited to the identification of a short list of potentially transferable technologies. It should include the identification of surrounding conditions that affect the transfer of those technologies in terms of identifying and analyzing the opportunities and risks relating to their transfer, preferences from businesses and government perspectives, carbon emission potential, etc. Also, it should include the identification, collection,

analysis, documentation, and dissemination of stimulating factors for their transfer in terms of investment potential, related policies, regulations, incentives, standards, etc.

From the above, a map of identified technologies and surrounding conditions could be developed and the information can be shared and made accessible to all stakeholders. Information sharing could be also coupled with knowledge building through developing a matrix that shows potential matchmaking (technology to geographic location; technology to incentives/regulations; stakeholder to stakeholder, etc.). The outputs (technology map and matrix) could be an input into a national/public database or through an online knowledge platform system where all relevant stakeholders, at national, regional and international levels, could have access. This will be a crucial step forwards to facilitate the process of matching seeds with needs.

3.1.2 Matching seeds with needs

There are low carbon technologies which are applicable to any country and under any conditions, but there are also low carbon technologies, which, although at commercialization stage in supply side countries, require extra effort to ensure matching them to local conditions in the recipient country. It is the latter group of new-to-the-market or new-to-the-firm technologies (seeds) which are addressed here. Matching those technologies to local conditions requires conducting feasibility studies to identify to what extent they should be renovated/customized to fit to local conditions. Feasibility studies should be followed by demonstration projects as well as by assessment of impact and capacity building elements to form an accurate assessment of whether the matching is possible or not. For instance, although feasibility studies (FS) and detailed studies (DS) could be conducted at the site level, and although technologies could be customized to fit to local conditions based on those FS/DS, the results on the ground from pilot projects implementation could be different from expectations. In addition, although technologies could be customized to fit to local conditions, further intervention may be necessary after pilot projects implementation to conduct fine tuning, adjustments and hand holding to cope with some conditions that haven't been taken into consideration, which may affect the results estimated during FS studies. Furthermore, some surrounding conditions, such as energy price, could fluctuate significantly between the time of FS/DS and the time after pilot project implementation[4]. Thus, a project which is identified as economically feasible before actual implementation may become exceedingly costly after implementation. Hence, pilot projects implementation is tremendously important to reveal actual impacts of applying technologies rather than making decisions based solely on feasibility studies.

Monitoring, reporting and verification (MRV) of the impact of implementing the technology in the recipient country is extremely important to evaluate the benefits and co-benefits from the implemented technology. This will be extremely important to communicate the findings with relevant stakeholders, such as government organizations, financial institutions, business associations, etc. and to engage them in the diffusion process.

Matching seeds with needs includes also providing the necessary capacity building to the

[4] Under a project conducted by IGES-KRC in India, gas price had increased from 28Rs/SCM to 42Rs/SCM between the date of F.S (Dec. 2012) and the date of actual implementation of pilot project (Dec. 2014).

recipients of the technology about operation, maintenance, trouble-shooting, etc. related to the provided technology. ADB argues that without developing the capacity to absorb and use the transferred knowledge, the returns on technology transfer are likely to be limited (ADB 2012, 24). This could be done through direct interaction with end users through providing onsite training. Capacity building should be also provided to other experts/professionals regarding the concept, functioning, and especially about how to conduct feasibility studies and how to assess the impacts of the provided technology. This could be done through training of trainers (ToT) programmes and provisions of materials and toolkits, preferably in local languages.

Hence, matching seeds with needs is not limited to matching technology to local conditions, but includes a matchmaking process among related stakeholders, especially Business to Policy maker (B2P) and Business to Business (B2B). Matching B2P and B2B is necessary to mobilize the necessary funds and expertise to conduct the above activities to match technology to local conditions (feasibility studies, detailed studies, pilot projects, impact assessment, capacity building and awareness creation).

3.1.3 Technology up-scaling and replication

As mentioned previously, there are low carbon technologies which are applicable to any country and under any conditions, hence up-scaling their diffusion could be easier compared to those which, although at commercialization stage in supply side countries, are new to the market and new to the firm in demand side countries. Widespread dissemination of the latter group of technologies requires the development of a local manufacturing base and associated supply chains; systems for marketing and maintenance; a labour force that can build, use, and maintain them; and, in many cases, their adaptation to local conditions at a wider level. Once their applicability is proven to be significant at the wider level, then up-scaling their transfer could be through the same measures that are used to up-scale the former group of technologies, such as through creating enabling environment for enhancing trade and FDI.

Of course, technology transfer and diffusion are also not automatic, easy and predictable processes, but they are basically functions of trade and investment, and these processes require an enabling environment. Creating the enabling environment for trade and FDI could include creating a supportive institutional infrastructure as well as introducing investment policies that respond to specific needs and situations, such as strengthening IPR, tax holidays, tariff adjustments, industry parks, making markets more transparent, etc., to stimulate markets for low carbon technologies transfer. Policy makers could also reduce or eliminate subsidies for fossil fuels as well as include environmental costs in the overall price of energy services to make low carbon technology financially and economically attractive. Furthermore, policy makers could develop product standards, instituting industry codes and certification procedures that are in favor of low carbon technologies. Also, policy makers could introduce low carbon technologies in state-owned companies, through public procurement, which will provide a showcase for the private sector to follow.

Trade and FDI policies can lead to more widespread adoption of technologies; however, they do not differentiate between low carbon technologies and other technologies and therefore may not create favorable conditions for the former ones in particular. For trade and FDI policies to promote

the transfer and diffusion of low carbon technologies they need to provide preferential treatment of such technologies. For example, the level of technology standards, tariff reduction, IPR, incentives for attracting FDI, etc. could be crafted in a way that are proportional to the level of GHG emission reduction potential of the transferred technology. This could limit the flow of "brown" technologies and the entry/relocation of businesses searching for pollution "heaven".

Creation of an enabling environment to enhance trade and FDI is not only the role of policy makers, but also requires the involvement of various intermediaries, such as research institutes, business associations, chamber of commerce, civil society, regional and international organizations, academia etc. who could enhance the enabling environment through their activities and capacity of matching related stakeholders, especially business to business (B2B), business to funding institutions (B2F), and business to policy makers (B2P).

For instance, various national policies could be in place to promote trade and FDI and to promote LCTT in general, however businesses, especially SMEs, funding institutions, civil society, etc. might not be aware of these policies. In addition, various stakeholders are working on the promotion of low carbon technologies and their work often overlaps. Creating a matchmaking process to enhance synergy among related stakeholders, from supply and demand sides, is crucial.

Matching B2B, B2F, and B2P could be through creating opportunities for direct interaction among them such as through onsite visits, inviting them to training programmes, workshops, exhibitions, etc. or through indirect interaction among them, through sharing information to them via knowledge and information platforms. Matching B2B is necessary to disseminate technologies and best operating practices (BOP) to businesses in the recipient country. It could be also necessary to develop partnership to produce the technology, or part of it, in the recipient country through licensing, joint venture, etc. Matching B2F is necessary to mobilize funding from banks, from energy service companies (ESCO), etc. that cannot be mobilized from the private or public sectors. Matching B2P is necessary to craft policies that create favorable conditions for the technology transfer, such as public procurement, etc.

It is widely recognized that initial cost is a main barrier for up-scaling the transfer of technologies. This is understandable if the technology is really significantly costly; however there are plenty of technologies/best operating practices that doesn't require any cost or requires just a minimum cost and their implementation results in significant emission reduction. Categorizing technologies according to their cost could be necessary[5] to create a role sharing among stakeholders. For example, technologies/BOPs which require zero to minimum investment cost could be up scaled by businesses themselves (matching B2B is needed). The only support to be provided to them to take up these technologies/BOPs is capacity development and awareness raising. Technologies/BOPs which require medium investment cost could be up scaled by energy service companies (ESCOs) and/or by loan from funding institutions (matching B2F is needed); technologies/BOPs which require high to very high investment cost, could be up scaled through

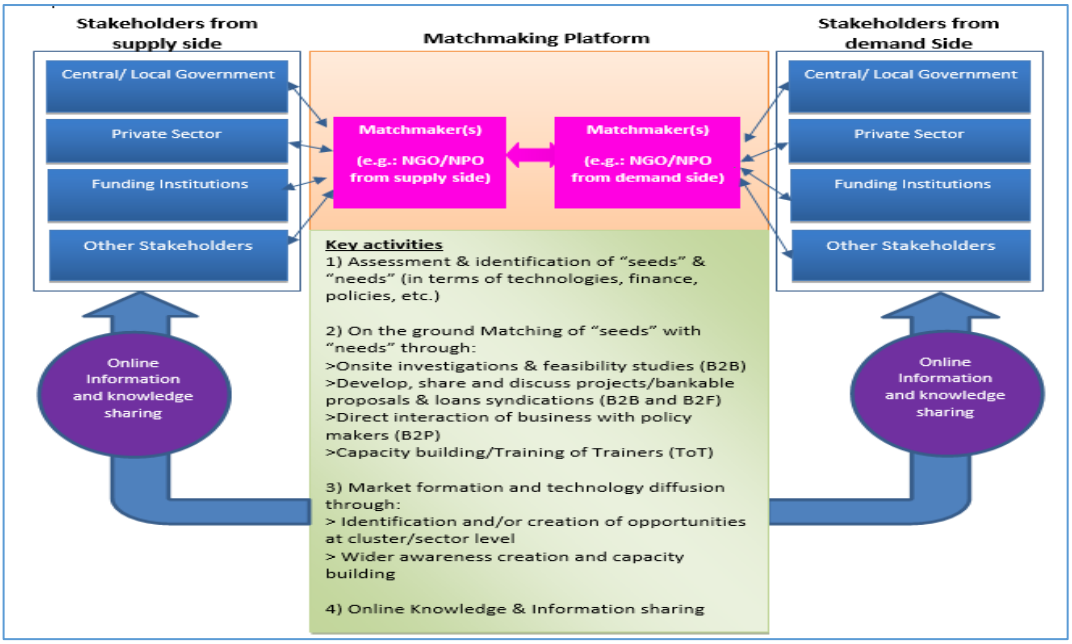
[5] Minimum, medium and high cost should be defined from business perspective, e.g. from SME's degree of affordability (Identify how much SMEs can afford to pay for low carbon/energy efficient technologies).

national, bilateral and other regional and international programs such as public procurements, clean development mechanisms (CDM), Joint crediting mechanisms (JCM), etc. (matching B2P is needed).

3.2 Initiate a bilateral stakeholders' matchmaking platform

Matching stakeholders and ultimately promoting LCTT, could be through initiating bilateral stakeholders' matchmaking platforms that pool the knowledge and synergize the efforts of various organizations and institutions from supply and demand sides. Platforms that have a role beyond just knowledge and information sharing. Platforms that have a role of assessment, mapping and "on the ground" and "online" matching of B2B, B2F, and B2P from supply and demand sides. The outputs from those platforms could be inputted into other existing national, regional and international technology centres and or platforms. The schematic diagram of a typical platform is depicted in Fig.3 below.

Fig.3 Schematic diagram of the bilateral stakeholders' matchmaking platform



3.2.1 Framework

A typical stakeholders' matchmaking platform will include implementing/executing agencies (core members) and will be open to other relevant agencies to join it as dialogue members. The implementing/executing agencies should be non-government and non for profit organizations (NGO/NPO), to make the platform more trustful. The dialogue members should be mainly those who have accumulated wide knowledge and expertise related to LCTT and who have strong business networks such as business associations, funding institutions, local and central government agencies, regional and international agencies, etc. Core members and dialogue members will coordinate among each other to facilitate the "on the ground" matching of seeds with needs through facilitating direct interaction among B2B, B2F and B2P as well as "online" matching through information and knowledge sharing regarding: technologies, policies and financing options from supply and demand sides.

3.2.2 Key activities:

The platform's members will coordinate and engage and match stakeholders, from supply and demand sides, through addressing the 3 stages of LCTT process, explained above, while coping with issues highlighted at each stage of them. For instance, the following could be conducted:

1) Assessment & identification of seeds and needs (Technologies, Finance schemes, Policies, etc.)
   >A matrix that shows potential matchmaking (technology to geographic location; technology to incentives/regulations; stakeholder to stakeholder, etc.) should be developed as well.
2) "On the ground" matching of seeds with needs (based on the findings from 1)):
   >Onsite investigations & feasibility studies along with Training of Trainers, through direct engagement of experts from private sector.
   >Development, sharing and discussion of project proposals, and if necessary provision of loans syndications.
   >Actual implementation of projects and best operation practices (BOP).
   >Direct interaction of business with policy makers.
3) Market formation and technology diffusion (based on findings from 2):
   >Follow-up regarding the implemented projects/BOP to ensure their continuous operation.
   >Identification and or creation of opportunities at cluster/sector level.
   >Explore the replication of the implemented projects/BOP at cluster/sector level.
   >Awareness creation and capacity building through dissemination workshops, and other outreach events.
4) Online Knowledge & Information sharing (based on findings from 1) 2) and 3).

3.2.2 Key feature of the proposed platform

The proposed platform could be considered as more practical, compared to existing platforms, since it is a bilateral platform involving implementing/executing agencies from supply and demand side rather than just from one side only. It provides a unique forum where technology providers and technologies seekers can interface directly as well as online with each other as well as with other relevant stakeholders, such as policy makers, funding agencies, and academia. In addition, it could be considered as more comprehensive since it will share information on

technologies, policies, and financing options rather than just on one of them. Furthermore, it could be considered as more systematic since it will address the various stages of LCTT process in coordinated manner through assessment, mapping and matching at each of the three stages of LCTT process, explained above. In this regards, it will give special focus on the follow up aspect, which is mainly missing in most of the existing platforms or initiatives. Last, but not the least, its ultimate goal is to materialize the opportunities rather than just identifying them. It aims to develop the information rather than just collecting it through developing matching matrixes based on the collected information, as well as direct involvement of the private sector.

Given that the funding rest a significant challenges. The proposed platform role will be in categorizing technologies/best operating practices according to their cost to create a role sharing among stakeholders. For example, it will provide capacity development and awareness raising to businesses about technologies/BOPs which require zero to minimum investment cost. For technologies which requires significant investment and businesses are unable to take them forward on their owns, then the platform will assist them in developing bankable proposals and share them with appropriate funding institutions at national, regional or international level.

The proposed matching platform is not an alternative option to existing ones, but rather a complementary one to them. For instance, CTCN's platform acts based on submitted requests from countries, however the proposed platform is the one who will identify the potential/idea/project and propose it to government who may consider it for submission as a request of assistance to CTCN's platform.

4. Conclusion

In the absence of an effective coordination mechanism, addressing all the stages of LCTT process is a challenging task. For instance there is no single initiative/programme is addressing the whole stages of LCTT processes. Efforts are so far fragmented and uncoordinated in terms of objective, content and country coverage. Significant information, knowledge, and expertise gaps still exist between supply and demand sides regarding the seeds and needs in terms of technologies and best operating practices (BOP); Perhaps, providing financial support is not the only way to promote LCTT. It is in this regards that to truly promote LCTT, this paper proposes to: 1) Address the whole process of LCTT rather than just part of it, and 2) Initiate stakeholders' matchmaking platforms. Stakeholders' matchmaking platforms that have a role beyond just knowledge and information sharing (as the case of most of existing platforms). Stakeholders' matchmaking platforms that have a role of assessment, mapping and "on the ground" matching of B2B, B2F, and B2P; a role of follow up process to the matching made (which is lacking in all existing platforms), along with an online information & knowledge sharing role.

The paper calls for initiating a bilateral stakeholders' matchmaking platform, as a trial basis at the very near future which could be replicated later on and could be considered as innovative business models to promote LCTT.

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Institute for Global Environmental Strategies (IGES)
Programme Management Office (PMO)
2108-11 Kamiyamaguchi, Hayama, Kanagawa, 240-0115, Japan
Tel: 046-826-9601 Fax: 046-855-3809 E-mail: pmo-info@iges.or.jp
www.iges.or.jp